

## Performance Evaluation of Clustered Routing Protocols for Heterogeneous Wireless Sensor Networks

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**Abstract :** Optimal routing allows minimizing energy consumption in wireless sensor networks (WSN). Clustering has proven its effectiveness in organizing WSN by reducing channel contention and packet collision and enhancing network throughput under heavy load. Therefore, nowadays, with the emergence of the Internet of Things, heterogeneity is essential. Stable election protocol (SEP) that has increased the network stability period and lifetime is the first clustering protocol for heterogeneous WSN. SEP and its descendants, namely SEP, Threshold Sensitive SEP (TSEP), Enhanced TSEP (ETSSEP) and Current Energy Allotted TSEP (CEATSEP), were studied. These algorithms' performance was evaluated based on different metrics, especially first node death (FND), to compare their stability. Simulations were conducted on the MATLAB tool considering two scenarios: The first one demonstrates the fraction variation of advanced nodes by setting the number of total nodes. The second considers the interpretation of the number of nodes while keeping the number of advanced nodes permanent. CEATSEP outperforms its antecedents by increasing stability and, at the same time, keeping a low throughput. It also operates very well in a large-scale network. Consequently, CEATSEP has a useful lifespan and energy efficiency compared to the other routing protocol for heterogeneous WSN.

**Keywords :** clustering, heterogeneous, stability, scalability, IoT, WSN

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